Lawrence Berkeley National Laboratory

Unique Scientific and Technological Approaches to Emerging Problems in Water Supply

Assessment, Prediction and Decision Support

- Develop and apply modeling and assessment tools to evaluate water supply and demand.
- Identify energy/water constrained areas, integrate energy/water management.
- Model feasibility and cost of engineering changes on water use efficiency in economic life-cycle cost analysis.
- Characterize groundwater and surface water systems: advanced hydrologic testing and geophysical tomography.
- Monitor, model and predict water supply and quality: for complex hydrology, multi-phase processes, with biogeochemistry.

Basic Science

- Develop new water resource analysis tools based on coupled atmosphere, land surface water, deep groundwater and water-energy use.
- Model and analyze variability in sources of water supply: advance understanding of water cycle storages, fluxes, and interfaces.
- Research multiphase flow processes from pore scale to regional scale.
- Evaluate interdependence of critical resources, including energy production and use with water cycle variability and water quality.

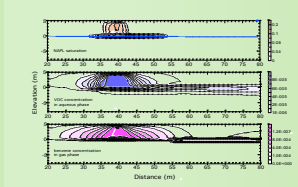
Technological Innovation

- Increase efficiency in water supply and treatment systems, including biodegradation methods and UV Waterworks, a device that uses UV light to remove micro-organisms in drinking water energy-efficiently.
- Decrease energy and water use by industries and buildings.
- Increase effectiveness of detection and analysis of contaminants in water.

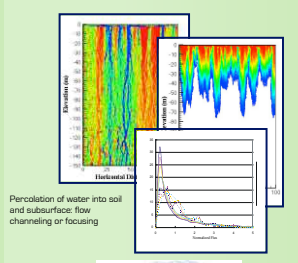
Implementation and Technology Transfer

- Co-Chair Workshop on the G-8 Global Earth Observing System of Systems (GEOSS) Implementation Plan and the International Water Cycle Ten Year Roadmap on Hydrology and Water Resources.
- Pilot projects for field-scale technology demonstration.
- Improve methods for predicting environmental and economic impacts.
- Outreach to stakeholders for planning and information transfer.

Basis for flow permeability in rocks: Study of pore shapes and connectivity

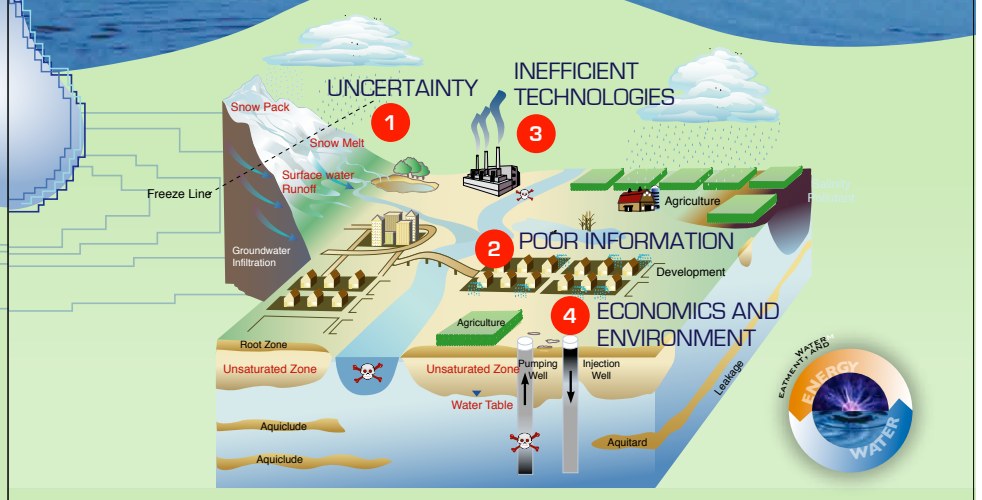


TMVOC: An advanced numerical model for multiphase flow in complex geological formation



Percolation of water into soil and subsurface: flow channeling or focusing

Coupling of climatic processes with land surface and ground water system



PROBLEMS:

1. Lack of a framework in which to use uncertain statistical information about climate variability to guide policy
2. Water-using products (clothes washers) and services (landscape irrigation) have no labels to inform consumer decisions about consumption volumes
3. In the planning stages, reviews are not always conducted to help industrial plants identify best technologies and practices to conserve energy and water
4. Energy and environmental impact and cost ramifications of adopting or abandoning specific water supply options are frequently ignored

BERKELEY LAB'S CONTRIBUTIONS:

1. Simulate regional climate and model energy and water—supply and demand—in local water sheds
2. Develop test procedures, protocols, labels, and databases to assist consumer decisions to purchase water and energy-efficient products and services
3. Develop industrial energy- and water-efficiency guides; develop real-time forecasting and management techniques to control quality
4. Integrate analysis of avoided production costs and evaluation of environmental costs and benefits to understand the marginal opportunity cost of energy and water saved through Best Management Practices ("BMPs")

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ENERGY EFFICIENCY and the ENVIRONMENTAL TECHNICAL ASSISTANCE TO THE WORLD

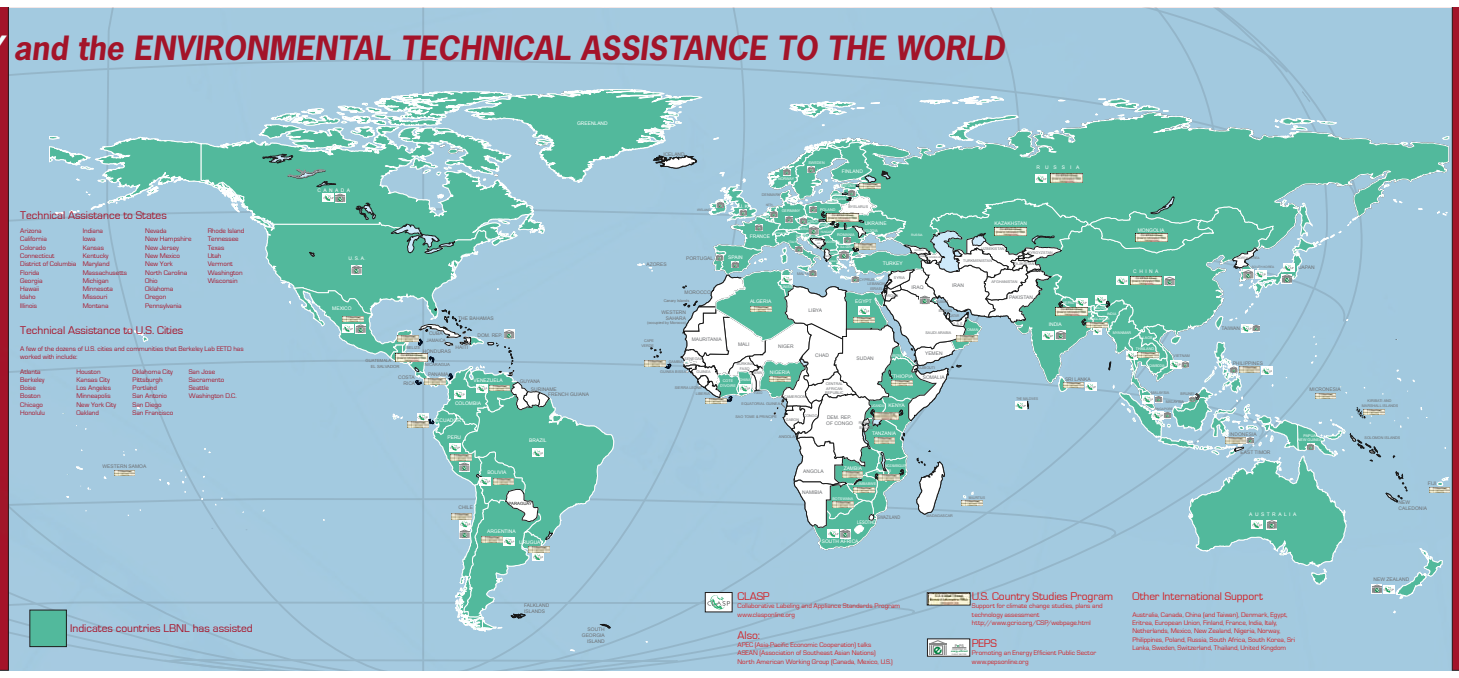
Locations of some past and present activities of the Department of Energy's Lawrence Berkeley National Laboratory's Environmental Energy Technologies Division

Researchers at Lawrence Berkeley National Laboratory's Environmental Energy Technologies Division have provided technical advice on energy efficiency and environmental issues to countries all over the world, as well as to many U.S. states, cities and federal agencies.

This map is not exhaustive, but shows examples of where some of the help went.

For more information, see:
eetd.lbl.gov
www.lbl.gov

U.S. Department of Energy Energy Efficiency and Renewable Energy



Berkeley Lab EETD has provided technical assistance on energy efficiency and air quality both directly to state agencies, and through federal/state partnerships.

Technical Assistance to, and Research Sponsored by State Agencies

California Department of Health Services
California Energy Commission
California Environmental Protection Agency
  California Air Resources Board
    Office of Environmental Health Hazard Assessment
California Urban Water Conservation Council
Energy Center of Wisconsin
New York State Energy Research and Development Authority
Oregon Office of Energy

Association of State Energy Research and Technology Transfer Institutes
National Association of State Energy Officials
State Technologies Advancement Collaborative

Technical Assistance to, and Research Sponsored by U.S. Federal Agencies

U.S. Department of Energy, including its:

Office of Energy Efficiency and Renewable Energy (primary sponsor) (www.eere.energy.gov)
  Federal Energy Management Program (www.eere.energy.gov/femp/)
  Office of Building Technologies, State and Community Programs
Office of Electricity Delivery and Energy Reliability (www.electricity.doe.gov)
Office of Science (www.sc.doe.gov)

U.S. Environmental Protection Agency including:
  Energy Star Program (www.energystar.gov)

Rebuild America (www.rebuild.org)

Other U.S. agencies:

Army, Advanced Research Projects Agency, Agency for International Development, Army Corps of Engineers, Bonneville Power Administration, Consumer Products Safety Commission, Department of Defense, Housing and Urban Development Federal Aviation Administration Food and Drug Administration, General Services Administration, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Park Service, Navy, Postal Service.

Technical Assistance to, and Research Sponsored by International Agencies

Australia Greenhouse Office
Global Environment Facility
Intergovernmental Panel on Climate Change
International Energy Agency
Organization for Economic Cooperation and Development
South Asia Regional Initiative
United Nations
UNEP
United Nations Department of Economic and Social Affairs
United Nations Development Program
United Nations Environment Program
United Nations Foundation
World Bank